

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: § Attorney Docket No. 2002-1147 / 24061.501
Wen-Chi CHIEN, et al. §
Serial No.: 10/719,721 § Group Art Unit: 2125
Filed: November 21, 2003 § Examiner: Shechtman, Sean P.
For: DYNAMICALLY ADJUSTING THE §
DISTRIBUTION FOR DISPATCHING §
LOT BETWEEN CURRENT AND §
DOWNSTREAM TOOL BY USING §
EXPERTISE WEIGHTING MECHANISM § Confirmation No.: 9530

Commissioner for Patents
Mail Stop Amendment
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT

Dear Sir:

No fees, including extension of time fees, are believed necessary for consideration of the present paper. However, if any fees, including extension of time fees, are necessary, the extension of time is hereby requested, and the Commissioner is hereby authorized to charge any fees, including those for the extension of time, to Haynes and Boone, LLP's Deposit Account No. 08-1394.

In response to the Office action of March 27, 2006, please amend the above-identified application as follows:

Amendments to the Specification begin on page 2 of this paper.

Amendments to the Claims are reflected in the listing of claims which begins on page 4 of this paper.

Remarks/Arguments begin on page 12 of this paper.

Amendments to the Specification:

Please note that all references to paragraph numbers in the specification refer to the paragraphs as numbered when the patent application was published by the USPTO (Patent Application Publication 20050113955 published on May 26, 2005). The original application-as-filed numbered paragraphs in a different manner.

Please delete paragraph [0007] which begins “Understanding the Fundamentals of Kanban and Conwip Pull Systems Using Simulation.”

Please delete paragraphs [0014] through [0037] which begin “An object of this invention is to provide a system ...” and end “... the product lot is placed on a queue of one of the first following pieces of manufacturing equipment.”

Please replace paragraph [0068] with the following amended paragraph:

[0068] The manufacturing execution systems **20a, . . . , 20n** maintain a manufacturing information database as shown in Fig. 3, and provide the appropriate product lot status and criticality factor to the dispatch system **35**. The manufacturing information database **200** illustrates the routing **205** for each product lot as it progresses through the pieces of equipment of each of the manufacturing stages **15a, 15b, . . . , 15n** or **25a, 25b, . . . , 25n**. The stage number is the designator for each manufacturing stage **15a, 15b, . . . , 15n** or **25a, 25b, . . . , 25n** through which a given product lot is to progress. In the illustration shown, the product lot is in one of the pieces of equipment of the manufacturing stage **210** designated **100**. The database **200** shows the dispatch view **215** and the lot view **220**. The dispatch view **215** exemplifies the lot dispatcher view where current tool (**200**) is the piece or group of pieces of manufacturing equipment that is to receive the product lot or lots upon completion. The downstream tools are the following and next following pieces

of manufacturing equipment in the succession of the process of the product lot. The lot view **220** shows the location of the product lot within each stage or the manufacturing stages **15a, 15b, . . . , 15n** or **25a, 25b, . . . , 25n**. The current tool **221** is performing the operation necessary for the current step of the process for the fabrication of the product lot. For instance, in an integrated circuit fabrication, if the piece of manufacturing equipment is a cleaning tool, the substrate will have contaminants and undesired process material removed. Alternately, if the piece of manufacturing equipment is a furnace, the substrate is subjected to an operation such as diffusion of material into the surface of the substrate. The next tool **222** is following in the process for which the dispatch schedule is being created. The next two tools **223** and **224** are the subsequent tools for which their capabilities, capacities, and queues are to be balanced in the dispatch the next tool **222**. The tool identification **225** provides the designation of the group of pieces of manufacturing equipment that is required in the recipe of the process for the product lot. The criticality factor **230** is a designation of the impact of the usage of the piece of manufacturing equipment on the time involved to process the product lot and the impact the piece of equipment has on in the flow of product lots through the manufacturing lines **5** and **10**. In this example there are two criticality levels, none or the group of pieces of manufacturing equipment does not have an impact on the processing time as indicated by a blank entry. The group of pieces of manufacturing equipment may be critical to the processing of the product lot as indicated by the **Y**. Alternately, if there is a long queue of product lots waiting for the particular piece of manufacturing equipment, the whole manufacturing line **5** or **10** may be slowed, thus delaying delivery of product lots in a timely fashion.

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently amended) A system for dispatching of at least one product lot for processing to a plurality of pieces of manufacturing equipment arranged in groups within processing stages of a manufacturing line, said system comprising:
 - a lot dispatcher in communication with an order entry system to receive requests for fabrication of a product lot, in communication with a process information system to receive procedures defining which pieces of manufacturing equipment [[is]] are required for said fabrication of said product lot, and in communication with a manufacturing information system to dynamically receive a status of said fabrication of said product lot, a criticality factor for each piece of manufacturing equipment, and a queue level for each piece of manufacturing equipment that follows a current group of pieces of manufacturing equipment required for said product lot; and
 - a priority factor calculator in communication with said lot dispatcher to receive a listing of said pieces of manufacturing equipment required for said fabrication of said product lot, said criticality factor, and said queue level, for determining a priority factor for said product lot such that each group of pieces of manufacturing equipment following said current group of pieces of manufacturing equipment has a balanced loading and said product lot is processed at an expeditious time for on-time delivery.
2. (Original) The system for dispatching of claim 1 wherein:
 - if groups of first following pieces of manufacturing equipment have a criticality factor of a first level, said priority factor has a first priority level, and

if groups of first following pieces of manufacturing equipment are of a first type and if groups of second following pieces of manufacturing equipment are of a second type, said priority factor has a second priority level.

3. (Original) The system for dispatching of claim 2 wherein if a magnitude of said first priority level achieves a threshold level, said product lot is immediately dispatched for processing.
4. (Currently amended) The system for dispatching of claim 2 wherein if said second priority level achieves a the threshold level, said product lot is immediately dispatched for processing.
5. (Original) The system for dispatching of claim 2 wherein:

 said priority factor calculator determines said first priority factor level by the formula:

$$KF_1 = \frac{WIP_c}{TOOL\#_c * PPH_c * EFF_c}$$

where:

KF_1 is said first priority level for a product lot entering a group of current pieces of manufacturing equipment

WIP_c is a number of items within all product lots in a queue for the group of first following pieces of manufacturing equipment,

TOOL#_c is a number of pieces of equipment within a group of the first following pieces of manufacturing equipment;

PPH_c is an average number of items of product capable of being manufactured by said group of the first following pieces of manufacturing equipment,

EFF_c is an efficiency factor for said group of the first following pieces of manufacturing equipment.

6. (Original) The system for dispatching of claim 2 wherein:

said priority factor calculator determines said second priority level by the formula:

$$KF_2 = \frac{WIP_cd + INPR_cd + WIP_d}{TOOL#_d * PPH_d * EFF_d}$$

where:

KF_2 is said second priority level for a product lot entering a current group of pieces of manufacturing equipment

WIP_cd is a number of items within all product lots in queue for the group of first following pieces of manufacturing equipment and the group of second following pieces of manufacturing equipment,

INPR_cd is a number of items within all product lots in queue for the group of first following pieces of manufacturing equipment which are to proceed subsequently to the group of second following pieces of manufacturing equipment,

WIP_d is a number of items within all product lots in queue for the group of second following pieces of manufacturing equipment,

TOOL#_d is number of pieces of equipment within a group of the second following pieces of manufacturing equipment;

PPH_d is an average number of items of product capable of being manufactured by said group of the second following pieces of manufacturing equipment,

EFF_d is an efficiency factor for said group of the second following pieces of manufacturing equipment.

7. (Original) The system for dispatching of claim 2 wherein if the group of first following pieces of manufacturing equipment has a criticality factor of a second level, said priority factor has a third priority level.
8. (Currently amended) The system for dispatching of claim 7 wherein if said third priority level indicates that said product lot should not be immediately dispatched for processing, said product lot is placed on ~~the~~ a queue of one of the first following pieces of manufacturing equipment.
9. (Original) The system for dispatching of claim 2 wherein if the group of first following pieces of manufacturing equipment is not of the first type, said priority factor has a fourth priority level.
10. (Original) The system for dispatching of claim 9 wherein if said fourth priority level indicates that said product lot should not be immediately dispatched for processing, said product lot is placed on one queue of one of the first following pieces of manufacturing equipment.
11. (Original) The system for dispatching of claim 2 wherein if the group of second following pieces of manufacturing equipment is not of the second type, said priority factor has a fifth priority level.
12. (Currently amended) The system for dispatching of claim 11 wherein if said fifth priority level indicates that said product lot should not be immediately dispatched for processing,

said product lot is placed on the a queue of one of the first following pieces of manufacturing equipment.

13. (Original) The system for dispatching of claim 2 wherein if the group of first following pieces of manufacturing equipment is of the first type, and the group of second following pieces of manufacturing equipment is of the second type, and the group of second following pieces of manufacturing equipment has a criticality factor that is not the first level, said priority factor has a sixth priority level.
14. (Currently amended) The system for dispatching of claim 13 wherein if said sixth priority level indicates that said product lot should not be immediately dispatched for processing, said product lot is placed on the a queue of one of the first following pieces of manufacturing equipment.
15. (Currently amended) The system for dispatching of claim 1 wherein said product lot is substrates onto which integrated circuits are fabricated.
16. (Original) The system for dispatching of claim 1 wherein said manufacturing equipment is integrated circuit processing equipment for the formation of integrated circuits upon substrates.
17. (Currently amended) The system for dispatching of claim [[1]] 16 wherein the integrated circuit processing equipment includes furnaces and substrate cleaning equipment.
- 18-85. (Cancelled)

86. (New) A method of selecting a selected product lot to be processed in a first piece of manufacturing equipment from a plurality of product lots ready for processing in the first piece of manufacturing equipment, the method comprising:

for each product lot in the plurality of product lots ready for processing, calculating a ranking factor for the product lot, the calculating comprising:

determining a first magnitude of processing to be done;

determining a second magnitude of production capacity; and

computing the ranking factor as a ratio of the first magnitude to the second magnitude;

determining a highest priority ranking factor; and

designating a product lot with the highest priority ranking factor as the selected product lot.

87. (New) The method of claim 86 wherein the calculating further comprises identifying a second piece of manufacturing equipment that will process the product lot subsequent to processing of the product lot by the first piece of manufacturing equipment.

88. (New) The method of claim 87 wherein the first magnitude is a count of product lots ready for processing in the second piece of manufacturing equipment.

89. (New) The method of claim 87 wherein the second magnitude is a function of:

a count of machines of a type of the second piece of manufacturing equipment;

an average number of product lots that a machine of the type of the second piece of manufacturing equipment is capable of processing; and

an efficiency factor for the second piece of manufacturing equipment.

90. (New) The method of claim 87 wherein one or more product lots ready for processing in the second piece of manufacturing equipment will be subsequently processed by a third piece of manufacturing equipment and the first magnitude is a sum of:

a count of product lots ready for processing in the second piece of manufacturing equipment that will be subsequently processed by the third piece of manufacturing equipment;

a count of product lots in processing by the second piece of manufacturing equipment that will be subsequently processed by the third piece of manufacturing equipment;

a count of product lots ready for processing in the third piece of manufacturing equipment.

91. (New) The method of claim 87 wherein one or more product lots ready for processing in the second piece of manufacturing equipment will be subsequently processed by a third piece of manufacturing equipment, and the second magnitude is a function of:

a count of machines of a type of the third piece of manufacturing equipment;

an average number of product lots that a machine of the type of the third piece of manufacturing equipment is capable of processing; and

an efficiency factor for the third piece of manufacturing equipment.

92. (New) The method of claim 87 wherein the calculating further comprises:

determining if the second piece of equipment is of a first type; and

if the second piece of equipment is not of the first type, assigning the ranking factor a first priority level.

93. (New) The method of claim 92 wherein the first type is critical.

94. (New) The method of claim 92 wherein the first priority level is zero.

95. (New) The method of claim 87 wherein one or more product lots ready for processing in the second piece of manufacturing equipment will be subsequently processed by a third piece of manufacturing equipment, and the calculating further comprises:

determining if the third piece of equipment is of a second type; and

if the third piece of equipment is not of the second type, assigning the ranking factor a second priority level.

96. (New) The method of claim 95 wherein the second type is critical.
97. (New) The method of claim 95 wherein the second priority level is zero.
98. (New) The method of claim 86 wherein the product lots are substrates for integrated circuits.
99. (New) The method of claim 86 wherein the first piece of manufacturing equipment is a piece of integrated circuit processing equipment.
100. (New) The method of claim 99 wherein the piece of integrated circuit processing equipment is one out of a group consisting of a furnace and a substrate cleaning machine.
101. (New) A method of processing a plurality of lots of semiconductor wafers in a semiconductor fabrication facility having a plurality of semiconductor processing equipment, the method comprising:
 - for each lot of wafers, receiving a process flow for the lot of wafers and identifying which groups of semiconductor processing equipment can be used for a next step of the process flow;
 - calculating a ranking factor for the plurality of lots, the calculating comprising determining a first magnitude of processing to be done, determining a second magnitude of production capacity, and computing the ranking factor as a ratio of the first magnitude to the second magnitude;
 - determining a highest priority ranking factor; and
 - designating a selected lot of wafers with the highest priority ranking factor to be processed by at least one of the semiconductor processing equipment.

REMARKS

Claims 1-85 were previously pending. Claims 18-85 are cancelled. Claims 1, 4, 8, 15, and 17 are amended. Claims 86-101 are new. Reconsideration of presently pending claims 1-17 and 86-101 is respectfully requested in light of the above amendments and the following remarks.

Objection Under 37 C.F.R. § 1.84

The drawings were objected to as failing to comply with 37 C.F.R. 1.84(p)(5). Paragraph [0068] has been amended to add a reference to Fig. 3, element 205. Applicant respectfully requests that the examiner withdraw his objection to the drawings.

Objection Under MPEP § 608.01

The disclosure was objected to because it contained an embedded hyperlink and/or other form of browser-executable code. Applicant has deleted paragraph [0007] of the specification to remove the embedded hyperlink and/or other form of browser-executable code. Applicant respectfully requests that the examiner withdraw his objection to the disclosure.

Rejections under 35 U.S.C. §112

Claims 1-85 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Applicant has canceled claims 18-85. Applicant has amended independent claim 1 and dependent claims 8, 12, 14, 15, and 17 to overcome the indefiniteness rejection under §112, second paragraph. Applicant intends the amendments to correct matters of form and not to affect the intended scope of the claims.

The examiner rejected claim 8 as lacking sufficient antecedent basis for the limitation “the queue of....” Applicant noted a similar limitation in claims 12 and 14 and has amended claims 12 and 14 to recite the limitation “a queue of....”

Rejections under 35 U.S.C. § 102

Claims 1-4, 7-17 stand rejected under 35 U.S.C. §102(e) as being anticipated by US Patent No. 6,842,655 to Collins (hereinafter referred to as "Collins"). As set forth at MPEP §2131, it is well-established:

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.

With respect to the claims as herein amended, this rejection is respectfully traversed.

Claim 1 is directed to a "system for dispatching of at least one product lot for processing." In contrast, the portion of the Collins specification cited by the examiner (col. 33, line 64 – col. 34, line 12) teaches only preparing a machine to perform a processing step.

Also, claim 1 describes "a lot dispatcher ... to dynamically receive ... a criticality factor for each piece of manufacturing equipment" and "a priority factor calculator ... to receive ... said criticality factor ... for determining a priority factor for said product lot." In contrast, the examiner cites that Collins (col. 6, lines 34-39) teaches only that a certain machine is assumed to be critical.

New Claims 86-101

Claims 86-101 have been added. Independent claims 86 and 101 both recite the limitations of "determining a second magnitude of production capacity; and computing the ranking factor as a ratio of the first magnitude to the second magnitude." Claims 86 and 101 are thus deemed to be patentable over the cited art

Response to non-final Office Action
dated March 27, 2006, for App. No. 10/719,721

Docket No. 2002-1147 / 24061.501
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Conclusion

It is clear from all of the foregoing that independent claims 1, 86 and 101 are in condition for allowance. Dependent claims 2-17 and 87-100 depend from and further limit independent claims 1 and 86 and therefore are allowable as well.

An early formal notice of allowance of claims 1-17 and 86-101 is requested.

Respectfully submitted,

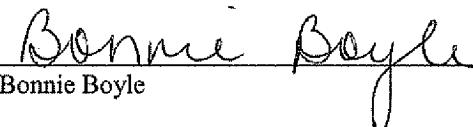

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I hereby certify that this correspondence is being filed with the U.S. Patent and Trademark Office via EFS-Web on June 14, 2006.


Bonnie Boyle